What is claimed is:

1. A resistance element comprising an electrical resistance body consisting of a carbon nanotube structure having a mesh structure, in which plural carbon nanotubes are cross-linked to one another through cross-linked sites.

2. A resistance element according to claim 1, wherein each of the cross-linked sites, where the plural carbon nanotubes are cross-linked to one another, has at least one chemical structure selected from the group consisting of $-COO(CH_2)_2OCO-$, $-COOCH_2CHOHCH_2OCO-$, $-COOCH_2CH(OCO-)CH_2OH$, $-COOCH_2CH(OCO-)CH_2OCO$, and $-COO-C_6H_4-COO-$.

3. A resistance element according to claim 1, wherein the carbon nanotube structure comprises the cross-linked sites formed by:

curing a liquid solution containing plural carbon nanotubes that have plural functional groups bonded thereto; and

chemically bonding together the plural functional groups that have the carbon nanotubes connected thereto.

4. A resistance element according to claim 2, wherein each of the cross-linked sites has a structure, in which the plural functional groups are cross-linked together through a cross-linking agent in the liquid solution.

5. A resistance element according to claim 4, wherein the cross-linking

agent is a not self-polymerizable cross-linking agent.

6. A resistance element according to claim 4, wherein:

each of the functional groups is at least one functional group selected from the group consisting of -OH, -COOH, -COOR (R is a substituted or unsubstituted hydrocarbon group), -COX (X is a halogen atom), $-NH_2$, and -NCO; and

the cross-linking agent is capable of prompting a cross-linking reaction with the selected functional groups.

7. A resistance element according to claim 6, wherein:

the cross-linking agent is at least one cross-linking agent selected from the group consisting of glycerin, ethylene glycol, butenediol, hexynediol, hydroquinone, and naphthalenediol; and

the functional groups are capable of prompting a cross-linking reaction with the selected cross-linking agent.

8. A resistance element according to claim 4, wherein:

each of the functional groups is at least one functional group selected from the group consisting of -OH, -COOH, -COOR (R is a substituted or unsubstituted hydrocarbon group), -COX (X is a halogen atom), $-NH_2$, and -NCO;

the cross-linking agent is at least one cross-linking agent selected from the group consisting of polyol, polyamine, polycarboxylic acid, polycarboxylate, polycarboxylic acid halide, polycarbodiimide, and polyisocyanate; and

the functional groups and the cross-linking agent are respectively selected for a combination capable of prompting a cross-linking reaction with one another.

9. A resistance element according to claim 2, wherein each of the functional groups is -COOR (R is a substituted or unsubstituted hydrocarbon group) and/or -COOH.

10. A resistance element according to claim 9, wherein the cross-linking agent is polyol.

11. A resistance element according to claim 10, wherein the cross-linking agent contains at least one cross-linking agent selected from the group consisting of glycerin, ethylene glycol, butenediol, hexynediol, hydroquinone, and naphthalenediol.

12. A resistance element according to claim 9, wherein the cross-linking agent is polyamine.

13. A resistance element according to claim 9, wherein the cross-linking agent is congo red.

14. A resistance element according to claim 9, wherein the cross-linking agent is an ammonium complex.

15. A resistance element according to claim 9, wherein the cross-linking agent is Cisplatin.

16. A resistance element according to claim 2, wherein the cross-linked sites are formed though chemical bonds of the plural functional groups.

17. A resistance element according to claim 16, wherein a reaction forming the chemical bonds is at least one reaction selected from the group consisting of a dehydration condensation, a substitution reaction, an addition reaction, and an oxidative reaction.

18. A resistance element according to claim 16, wherein each of the cross-linked sites, where the plural carbon nanotubes are cross-linked to one another, has at least one chemical structure selected from the group consisting of -COOCO-, -O-, -NHCO-, -COO-, -NCH-, -NH-, -S-, -O-, -NHCOO-, and -S-S-.

19. A resistance element according to claim 16, wherein the carbon nanotubes that have functional groups react through a dehydration condensation to cross-link the carbon nanotubes.

20. A resistance element according to claim 19, wherein each of the functional groups is -COOH.

21. A resistance element according to claim 20, wherein each of the cross-linked sites, where the plural carbon nanotubes cross-link to one another, is -COOCO-.

22. A resistance element according to claim 1, wherein the plural carbon nanotubes are multi-wall carbon nanotubes.

23. A method of manufacturing a resistance element, comprising the steps of:

supplying a base body surface with a liquid solution containing plural carbon nanotubes that have plural functional groups bonded thereto; and

cross-linking the plural carbon nanotubes to one another through chemical bonding the plural functional groups together to configure a mesh structure, thereby forming a carbon nanotube structure layer, which is used as an electrical resistance body.

24. A method of manufacturing a resistance element according to claim 23, wherein the supplying step is an applying step in which the liquid solution is applied to the base body surface.

25. A method of manufacturing a resistance element according to claim 23, further comprising a patterning step in which the carbon nanotube structure layer is patterned to a shape corresponding to the electric resistance body.

26. A method of manufacturing a resistance element according to claim 25, wherein the patterning step further comprises patterning the carbon nanotube structure layer to a pattern corresponding to the electric resistance body by conducting dry etching on a region of the carbon nanotube structure layer on the base body surface without a pattern corresponding to the electric resistance body, to remove the carbon nanotube structure layer of the region.

27. A method of manufacturing a resistance element according to claim 25, wherein the patterning step further comprises:

a resist layer forming step, in which a resist layer is provided above a region of the carbon nanotube structure on the base body surface with a pattern corresponding to the electric resistance body; and

a removing step, in which dry etching is conducted on a base body surface, where the carbon nanotube structure layer and the resist layer are layered, to remove an expressed region of the carbon nanotube structure layer other than the patterned region.

28. A method of manufacturing a resistance element according to claim 27, wherein a radical of an oxygen molecule is emitted to the base body surface, where the carbon nanotube structure and the resist layer are layered, in the removing step.

29. A method of manufacturing a resistance element according to claim 28, wherein:

an oxygen radical is generated by irradiating the oxygen molecule with an ultraviolet ray; and

the oxygen radical is used as the radical emitted to the base body surface, where the carbon nanotube structure and the resist layer are layered.

30. A method of manufacturing a resistance element according to claim 27, wherein the patterning step further comprises a resist layer peeling step in which the resist layer provided in the resist layer forming step is peeled off successively after the removing step.

31. A method of manufacturing a resistance element according to claim 27, wherein the resist layer is a resin layer.

32. A method of manufacturing a resistance element according to claim 25, wherein the patterning step comprises the steps of:

emitting ions of a gas molecule through an ion beam to a region of the carbon nanotube structure without a pattern corresponding to the electric resistance body on the base body surface to remove the carbon nanotube structure from the region; and

patterning the carbon nanotube structure to a pattern corresponding to the electrical resistance body.

33. A method of manufacturing a resistance element according to claim 23, wherein the liquid solution includes a cross-linking agent that cross-links the

plural functional groups together.

34. A method of manufacturing a resistance element according to claim 25, wherein the cross-linking agent is a not self-polymerizable cross-linking agent.

35. A method of manufacturing a resistance element according to claim 33, wherein:

each of the functional groups is at least one functional group selected from the group consisting of -OH, -COOH, -COOR (R is a substituted or unsubstituted hydrocarbon group), -COX (X is a halogen atom), $-NH_2$, and -NCO; and

the cross-linking agent is capable of prompting a cross-linking reaction with the selected functional groups.

36. A method of manufacturing a resistance element according to claim 33, wherein:

the cross-linking agent is at least one cross-linking agent selected from the group consisting of polyol, polyamine, polycarboxylic acid, polycarboxylate, polycarboxylic acid halide, polycarbodiimide, and polyisocyanate; and

the functional groups are capable of prompting a cross-linking reaction with the selected cross-linking agent.

37. A method of manufacturing a resistance element according to claim 33, wherein:

each of the functional groups is at least one functional group selected from the group consisting of -OH, -COOH, -COOR (R is a substituted or unsubstituted hydrocarbon group), -COX (X is a halogen atom), $-NH_2$, and -NCO;

the cross-linking agent is at least one cross-linking agent selected from the group consisting of polyol, polyamine, polycarboxylic acid, polycarboxylate, polycarboxylic acid halide, polycarbodiimide, and polyisocyanate; and

the functional groups and the cross-linking agents are respectively selected for a combination capable of prompting a cross-linking reaction with one another.

38. A method of manufacturing a resistance element according to claim 33, wherein each of the functional group is at least one of -COOR (R is a substituted or unsubstituted hydrocarbon group) and -COOH.

39. A method of manufacturing a resistance element according to claim 38, wherein the cross-linking agent is polyol.

40. A method of manufacturing a resistance element according to claim 34, wherein the cross-linking agent is at least one cross-linking agent selected from the group consisting of glycerin, ethylene glycol, butenediol, hexynediol, hydroquinone, and naphthalenediol.

41. A method of manufacturing a resistance element according to claim 33, wherein the liquid solution further includes a solvent.

42. A method of manufacturing a resistance element according to claim 33, wherein the cross-linking agent also functions as a solvent.

43. A method for manufacturing a resistance element according to claim 33, wherein the cross-linking agent is polyamine.

44. A method of manufacturing a resistance element according to claim 33, wherein the cross-linking agent is congo red.

45. A method of manufacturing a resistance element according to claim 33, wherein the cross-linking agent is an ammonium complex.

46. A method of manufacturing a resistance element according to claim 33, wherein the cross-linking agent is Cisplatin.

47. A method of manufacturing a resistance element according to claim 23, wherein a reaction forming the chemical bonds is a reaction for chemical bonding the plural functional groups together.

48. A method of manufacturing a resistance element according to claim 47, wherein the liquid solution further includes an additive that forms the chemical bonds among the functional groups.

49. A method of manufacturing a resistance element according to claim 48, wherein the reaction is a dehydration condensation and the additive is a condensing agent.

50. A method of manufacturing a resistance element according to claim 49, wherein each of the functional groups is at least one functional group selected from the group consisting of -COOR (R is a substituted or unsubstituted hydrocarbon group), -COOH, -COX (X is a halogen atom), -OH, -CHO-, and $-NH_2$.

51. A method of manufacturing a resistance element according to claim 49, wherein each of the functional groups is -COOH.

52. A method of manufacturing a resistance element according to claim 51, wherein the condensing agent is at least one compound selected from the group consisting of sulfuric acid, N-ethyl-N'-(3-dimethylaminopropyl)carbodiimide, and dicyclohexyl carbodiimide.

53. A method of manufacturing a resistance element according to claim 48, wherein the reaction is a substitution reaction and the additive is a base.

54. A method of manufacturing a resistance element according to claim 53, wherein each of the functional groups is at least one functional group selected from the group consisting of $-NH_2$, -X (X is a halogen atom), -SH, -OH, $-OSO_2CH_3$, and $-OSO_2(C_6H_4)CH_3$.

55. A method of manufacturing a resistance element according to claim 53, wherein the base is at least one base selected from the group consisting of sodium hydroxide, potassium hydroxide, pyridine, and sodium ethoxide.

56. A method of manufacturing a resistance element according to claim 47, wherein the reaction is an addition reaction.

57. A method of manufacturing a resistance element according to claim 56, wherein each of the functional groups is -OH and/or -NCO.

58. A method of manufacturing a resistance element according to claim 47, wherein the reaction is an oxidative reaction.

59. A method of manufacturing a resistance element according to claim 58, wherein each of the functional groups is -SH.

60. A method of manufacturing a resistance element according to claim 58, wherein the liquid solution further includes an oxidative reaction accelerator.

61. A method of manufacturing a resistance element according to claim 60, wherein the oxidative reaction accelerator is iodine.

62. A thermistor comprising:

a carbon nanotube structure as a thermistor base, the carbon nanotube structure having a mesh structure, in which plural carbon nanotubes are cross-linked to one another through plural cross-linked sites, and having a prescribed temperature dependence of electrical resistivity.